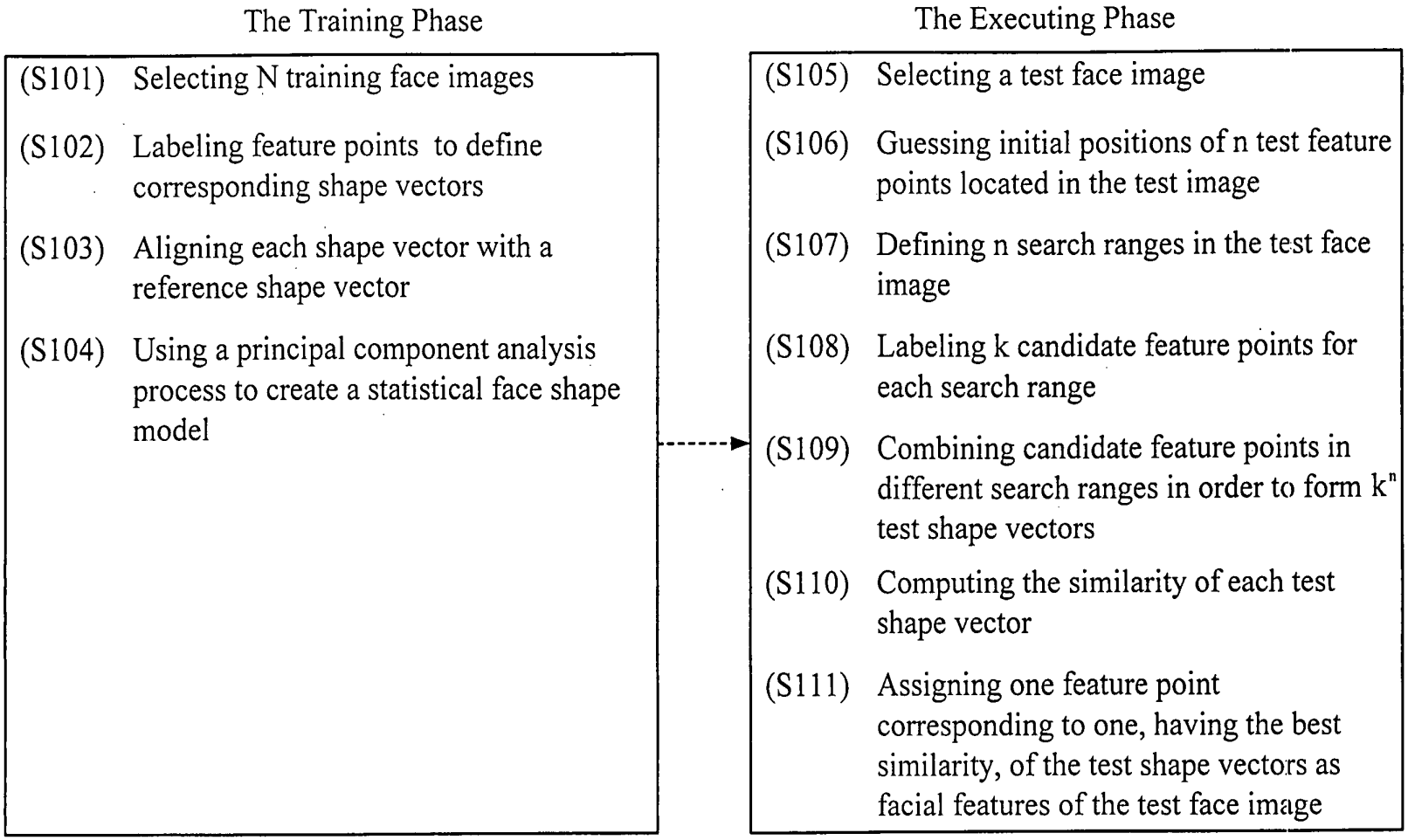
The Training Phase
(S101) Selecting N training face images
(S102) Labeling feature points to define corresponding shape vectors
(S103) Aligning each shape vector with a reference shape vector
(S104) Using a principal component analysis process to create a statistical face shape model
The Executing Phase
(S105) Selecting a test face image
(S106) Guessing initial positions of n test feature points located in the test image
(S107) Defining n search ranges in the test face image
(S108) Labeling k candidate feature points for each search range
(S109) Combining candidate feature points in different search ranges in order to form k^n test shape vectors
(S110) Computing the similarity of each test shape vector
(S111) Assigning one feature point corresponding to one, having the best similarity, of the test shape vectors as facial features of the test face image

FIG. 1

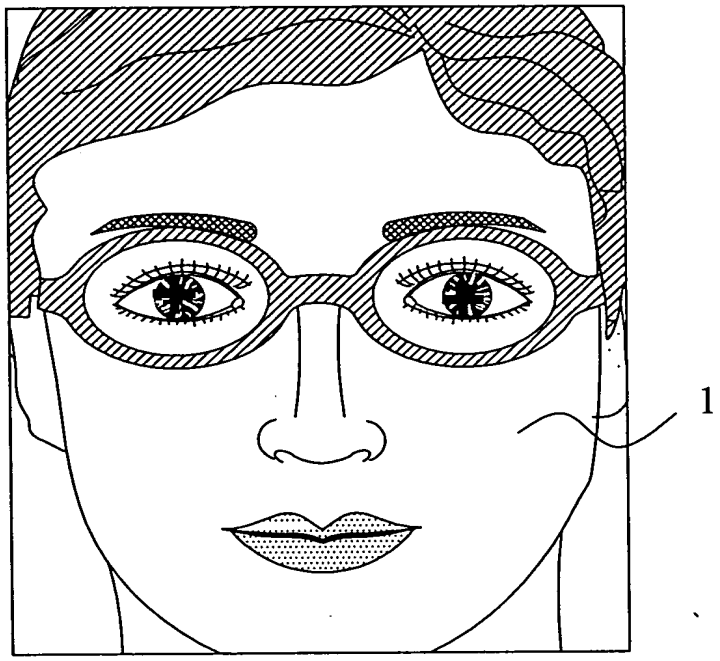

FIG. 2

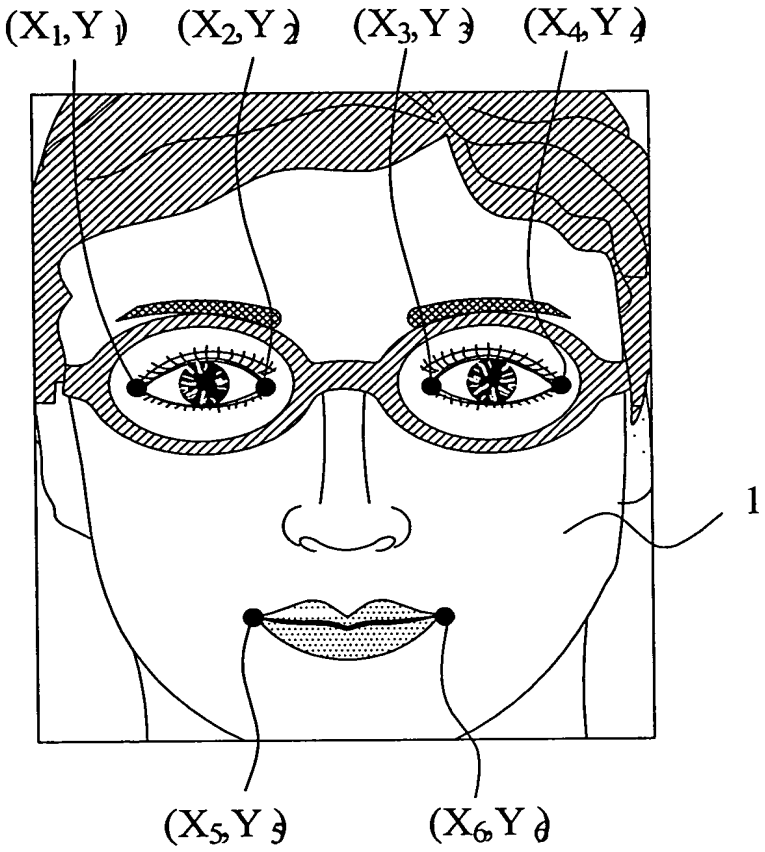

FIG. 3

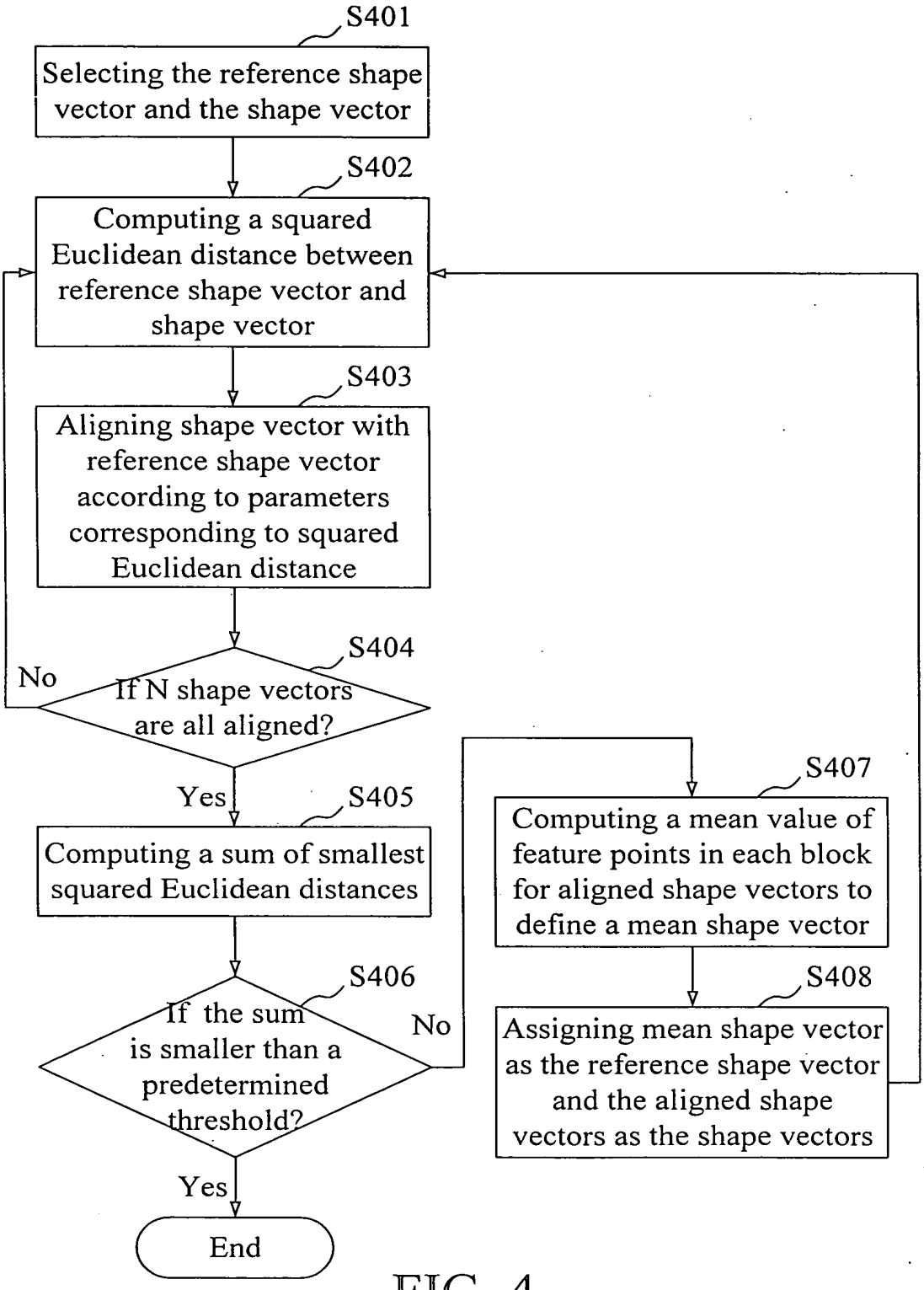
S401
Selecting the reference shape vector and the shape vector
S402
Computing a squared Euclidean distance between reference shape vector and shape vector
S403
Aligning shape vector with reference shape vector according to parameters corresponding to squared Euclidean distance
S404
If N shape vectors are all aligned?
No
Yes
S405
Computing a sum of smallest squared Euclidean distances
S406
If the sum is smaller than a predetermined threshold?
No
Yes
End
S407
Computing a mean value of feature points in each block for aligned shape vectors to define a mean shape vector
S408
Assigning mean shape vector as the reference shape vector and the aligned shape vectors as the shape vectors

FIG. 4

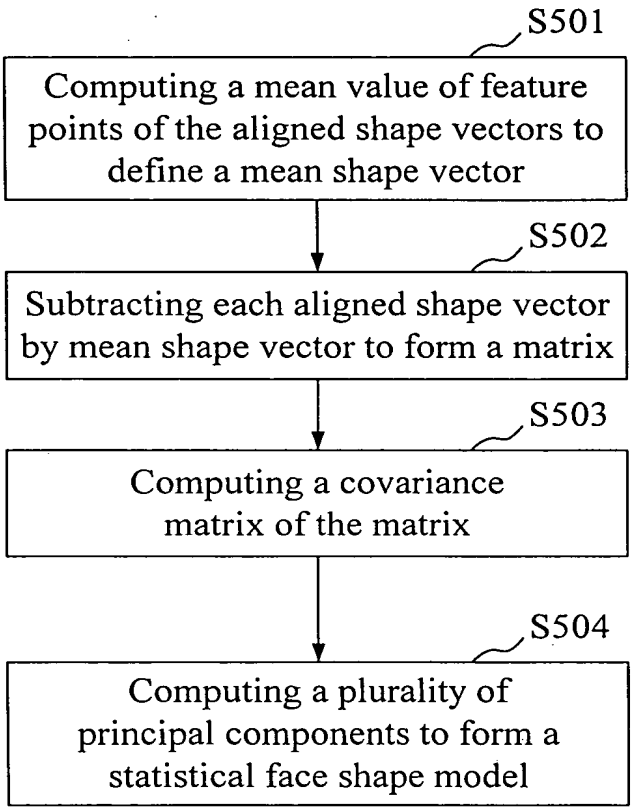
S501
Computing a mean value of feature points of the aligned shape vectors to define a mean shape vector
S502
Subtracting each aligned shape vector by mean shape vector to form a matrix
S503
Computing a covariance matrix of the matrix
S504
Computing a plurality of principal components to form a statistical face shape model

FIG. 5

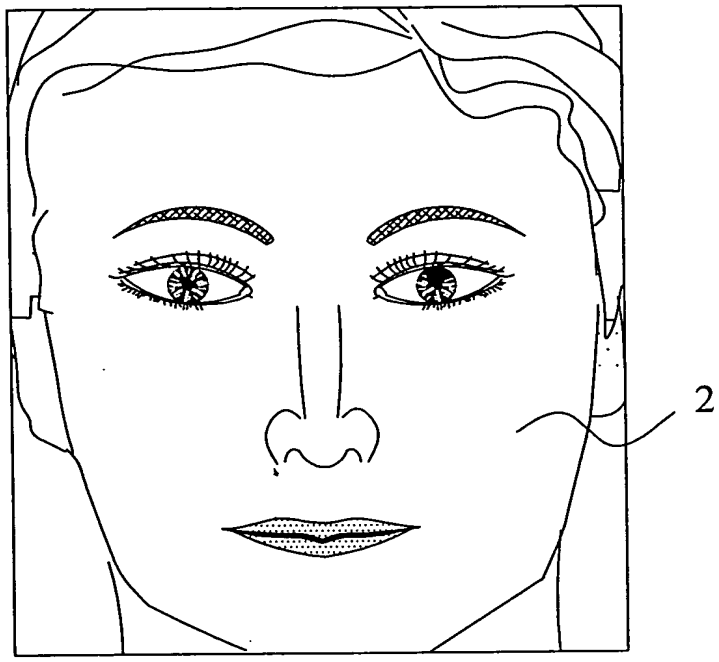

FIG. 6

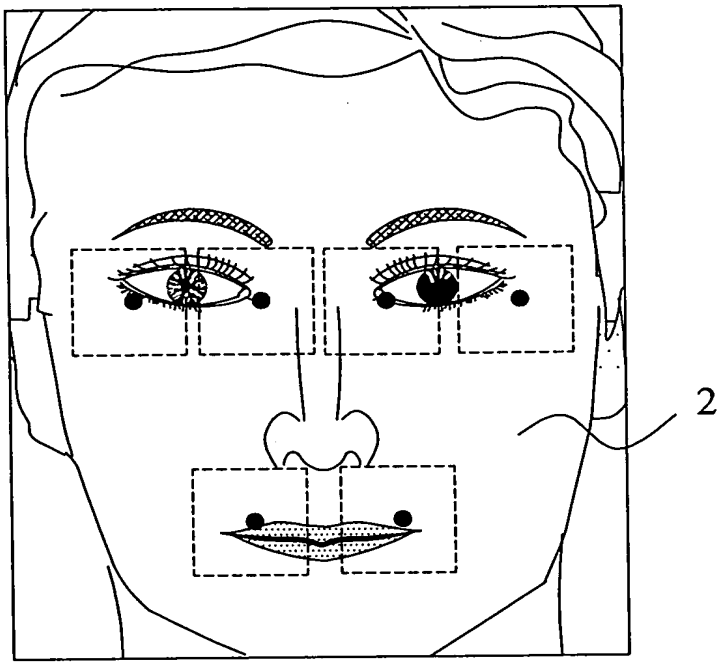

FIG. 7

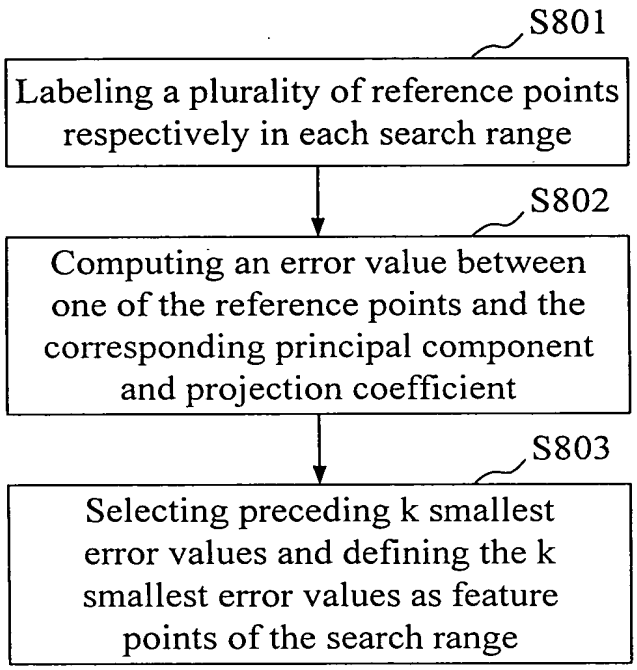
S801
Labeling a plurality of reference points respectively in each search range
S802
Computing an error value between one of the reference points and the corresponding principal component and projection coefficient
S803
Selecting preceding k smallest error values and defining the k smallest error values as feature points of the search range

FIG. 8

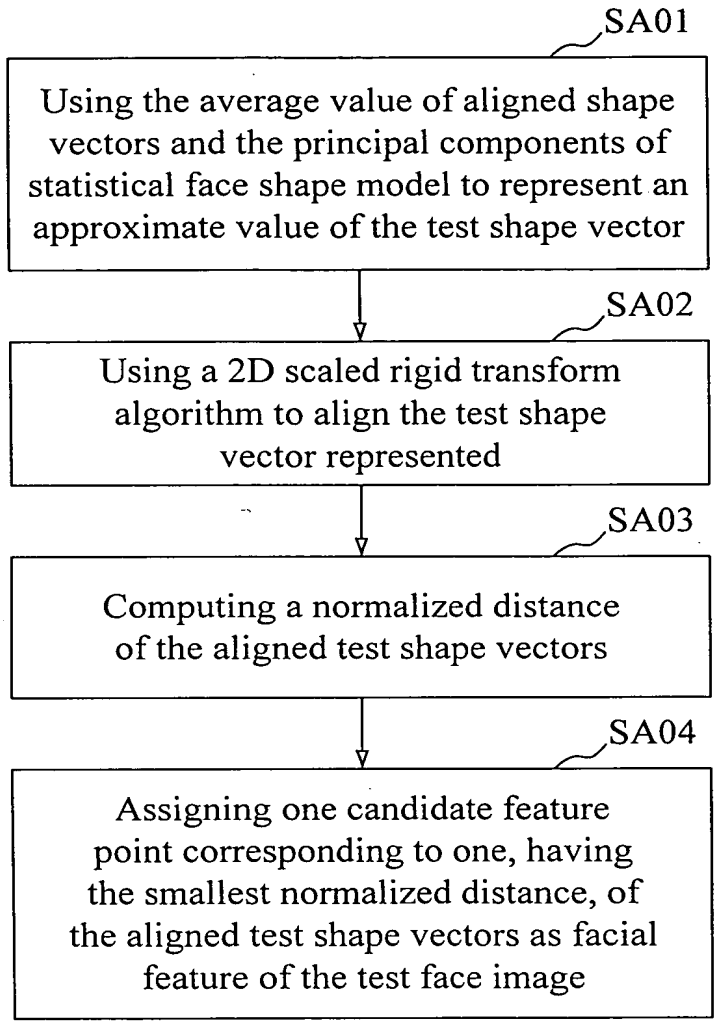
SA01
Using the average value of aligned shape vectors and the principal components of statistical face shape model to represent an approximate value of the test shape vector
SA02
Using a 2D scaled rigid transform algorithm to align the test shape vector represented
SA03
Computing a normalized distance of the aligned test shape vectors
SA04
Assigning one candidate feature point corresponding to one, having the smallest normalized distance, of the aligned test shape vectors as facial feature of the test face image

FIG. 9

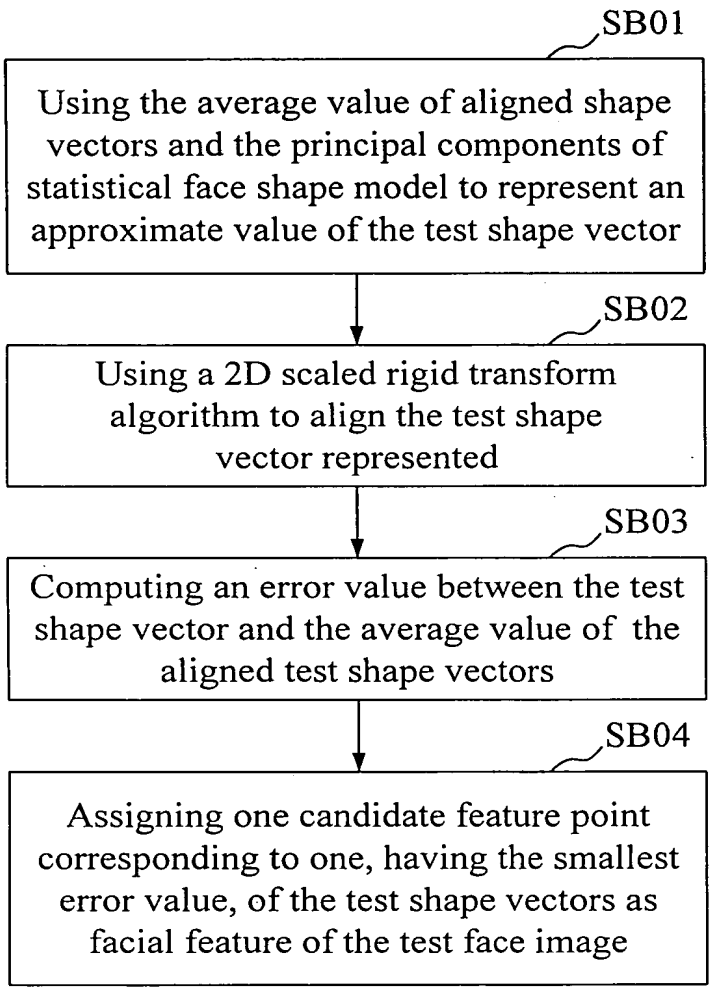
SB01
Using the average value of aligned shape vectors and the principal components of statistical face shape model to represent an approximate value of the test shape vector
SB02
Using a 2D scaled rigid transform algorithm to align the test shape vector represented
SB03
Computing an error value between the test shape vector and the average value of the aligned test shape vectors
SB04
Assigning one candidate feature point corresponding to one, having the smallest error value, of the test shape vectors as facial feature of the test face image

FIG. 10